

EAST Search History

JWS

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L17	231	239/464.CCLS.	US-PGPU B; USPAT; USOCR; EPO; JPO; DERWEN T; IBM_TDB	OR	ON	2007/04/30 03:33

EAST Search History

NJS

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	893	(239/472.CCLS. OR 239/487.CCLS. OR 239/488.CCLS.)	US-PGPU B; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/30 02:23
L2	167	(239/472.CCLS. OR 239/487.CCLS. OR 239/488.CCLS.) AND (WASH\$4 OR CLEAN\$4 OR "134"/\$.CCLS.)	US-PGPU B; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/30 02:25
L5	291	(239/472.CCLS. OR 239/487.CCLS. OR 239/488.CCLS.) AND (VORTEX\$4 OR HELICAL\$4 OR SPIRAL\$4)	US-PGPU B; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/30 02:32
L11	122	"134"/\$.CCLS. AND ((VORTEX\$4 OR HELICAL\$4 OR SPIRAL\$4 OR SWIRL\$4 OR TORNADO OR WHIRL\$4) NEAR6 (PATTERN OR STREAM OR SPRAY OR SHAPE) NEAR6 (NOZZLE OR JET OR SHOWER OR SPRAYER))	US-PGPU B; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/04/30 02:57



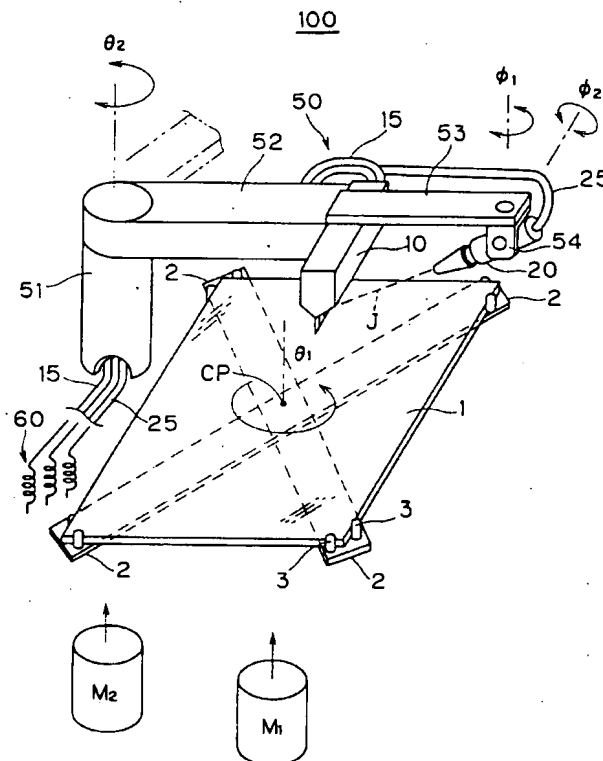
US005975098A

United States Patent [19]

Yoshitani et al.

[11] **Patent Number:** **5,975,098**[45] **Date of Patent:** **Nov. 2, 1999**[54] **APPARATUS FOR AND METHOD OF
CLEANING SUBSTRATE**[75] Inventors: **Mitsuaki Yoshitani; Kazuo Kinose;
Satoru Tanaka; Kenya Morinishi;
Masahiro Miyagi**, all of Shiga;
Naoshige Itami; Kazuhiro Watanabe,
both of Kanagawa, all of Japan[73] Assignees: **Dainippon Screen Mfg. Co., Ltd.;**
Fujitsu Limited, both of Japan[21] Appl. No.: **08/775,712**[22] Filed: **Dec. 17, 1996**[30] **Foreign Application Priority Data**Dec. 21, 1995 [JP] Japan 7-333120
Dec. 21, 1995 [JP] Japan 7-333121[51] Int. Cl.⁶ **B08B 3/02**[52] U.S. Cl. **134/148; 134/153; 134/181;
134/198; 134/902; 134/184**[58] **Field of Search** **134/148, 153,
134/902, 172, 181, 184, 198; 239/102.2**[56] **References Cited****U.S. PATENT DOCUMENTS**4,064,885 12/1977 Dussault et al. 134/184
4,326,553 4/1982 Hall 134/902
5,100,476 3/1992 Mase et al. 134/184
5,186,389 2/1993 Shibano .5,368,054 11/1994 Koretsky et al. 134/902
5,512,335 4/1996 Miller et al. 134/186
5,601,655 2/1997 Bok et al. 134/902**FOREIGN PATENT DOCUMENTS**54-103266 8/1979 Japan 134/184
61-181134 8/1986 Japan .
62-188323 8/1987 Japan 134/902
1-105376 4/1989 Japan .
3-14230 1/1991 Japan 134/902
4-213827 8/1992 Japan 134/902
5-175184 7/1993 Japan 134/902
6-120136 4/1994 Japan 134/902*Primary Examiner*—Frankie L. Stinson*Attorney, Agent, or Firm*—Ostrolenk, Faber, Gerb & Soffen,
LLP[57] **ABSTRACT**

A substrate rinsing apparatus of a non-contact type having a high rinsing ability. An ultrasonic rinsing nozzle and a high-pressure rinsing nozzle are both disposed within the same rinsing apparatus. The ultrasonic rinsing nozzle ejects ultrasonic rinsing liquid as a curtain through a slit, while the high-pressure rinsing nozzle ejects a high-pressure rinsing jet toward the ultrasonic rinsing liquid which is ejected toward a substrate. Not only is foreign matter removed by ultrasonic rinsing, but foregoing matter is removed by the high-pressure rinsing jet and is carried away by a flow of the ultrasonic rinsing liquid and washed off the substrate toward a downstream side of rotation of the substrate.

27 Claims, 23 Drawing Sheets

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L13	832	134/123.CCLS.	US-PGPU B; USPAT; USOCR; FPRS; EPO; JPO; DERWEN T; IBM_TDB	OR	ON	2007/04/30 03:15
L14	1316	134/198.CCLS.	US-PGPU B; USPAT; USOCR; FPRS; EPO; JPO; DERWEN T; IBM_TDB	OR	ON	2007/04/30 03:15
L16	45	((CAR OR VEHICLE OR TRUCK OR AUTO OR AUTOMOBILE) NEAR5 (WASHING OR WASH OR CLEAN\$4)) AND ((VORTEX\$4 OR HELICAL\$4 OR SPIRAL\$4 OR SWIRL\$4 OR TORNADO) NEAR6 (PATTERN OR STREAM OR SPRAY OR SHAPE) NEAR6 (NOZZLE OR JET OR SHOWER OR SPRAYER))	US-PGPU B; USPAT; USOCR; EPO; JPO; DERWEN T; IBM_TDB	OR	ON	2007/04/30 03:23